

**METHOD AND APPARATUS FOR SEPARATING BITUMEN  
FROM PARTICULATE SUBSTRATES**

ABSTRACT

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Method and apparatus for treating an ore comprising mineral substrate particles surrounded by hydrocarbon compounds, especially tar sand grains and contaminated soils, to recover a hydrocarbon portion and a cleaned substrate portion. In a preferably continuous process, hydrocarbonaceous rock, sand, ore, or soil containing bitumen, petroleum, and/or kerogen may be crushed or otherwise comminuted as needed to provide a particle size of sand or smaller. The ore is mixed with water to form a slurry. The slurry is heated to about 80°C and is intensively sheared to condition the slurry for separation, preferably by shear-fracture of the hydrocarbon layers surrounding the particles in the grains. The conditioned slurry is blended with a peroxide in aqueous solution, preferably hydrogen peroxide, which enters the grains and is decomposed therein, creating bubbles of free oxygen within the grains which disrupt the hydrocarbon envelope. In decomposing, the peroxide increases the hydrophilicity of the particle surfaces. Both free and bound hydrocarbons in the ore are thereby released from the mineral substrate particles. The resulting hydrocarbon globules are separated from the substrate particles by flotation, accelerated by attached oxygen bubbles. Water and mineral tailings from the process are substantially free of hydrocarbon contamination and are environmentally suitable for landfill disposal.